CONTENTS (Continued)

ABBREVIATIONS AND ACRONYMS

µg/L	Microgram per liter
ACM	Asbestos-containing material
AHERA	Asbestos Hazard Emergency Response Act
AMC	U.S. Army Materiel Command
AMCCOM	U.S. Army Armament, Munitions, and Chemical Command
AMCOM	U.S. Army Aviation and Missile Command
AST	Aboveground storage tank
ASTM	American Society for Testing and Materials
ATCOM	U.S. Army Aviation and Troop Command
ATSDR	Agency for Toxic Substances and Disease Registry
AVSCOM	U.S. Army Aviation Systems Command
bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene, and xylene
CALM	Cleanup Levels for Missouri
CAP	Corrective action plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
COE	U.S. Army Corps of Engineers
CONSENT	CERCLA Consent Decrees
COR	Contracting office representative
CORRACTS	Corrective Action Report
DGPS	Differential global positioning system
EBS	Environmental baseline survey
EDR	Environmental Data Resources, Inc.
EPA	U.S. Environmental Protection Agency
ERNS	Emergency Response Notification System
ESA	Environmental site assessment
FINDS	Facility Index System
FOIA	Freedom of Information Act
ft^2	Square foot
GSA	General Services Administration
HMIRS	Hazardous Materials Information Report System
LBP	Lead-based paint
LQG	Large-quantity generator
LUST	Leaking Underground Storage Tank
MDNR	Missouri Department of Natural Resources
mg/cm^2	Milligram per square centimeter
mg/kg	Milligram per kilogram
mg/L	Milligram per liter

A letter from MDNR's Division of State Parks dated 21 Jan 94 indicates that none of the SLAAP structures are eligible for inclusion on the National Registry of Historic Places (MDNR 1994).

4.6 WETLANDS

A 1994 National Wetlands Inventory map of the area within 2 miles of SLAAP was reviewed to identify surface water bodies and wetlands. According to the map, the closest wetland is approximately 1.4 miles east of SLAAP, and another wetland lies approximately 1.5 miles northwest of SLAAP. No wetlands were identified on the SLAAP property or in its immediate vicinity (EDR 1999).

were redesignated as Buildings 3, 5, 6, and 9 (202 F and 202 H), respectively. In addition, Buildings 1, 2, 4, 7, 7A, 8, 8A, 10, 11, 11A, and 11B were built in 1944 to support 105-mm Howitzer shell production.

Building 1, Billet Cutting Building

A support function at SLAAP required the production of acetylene gas through the reaction of calcium carbide with water. The acetylene was produced and stored at Building 9. A mixture of acetylene and oxygen was used to score (nick) the steel billets before breaking operations in Building 1. The oxygen generator was located next to Building 9.

Figure 6-5 shows the approximate location of major equipment in Building 1. In this building, long shell billets were cut to prescribed lengths using a nicking and breaking method. Squared billets were stocked at the billet storage areas east and west of Building 1. The steel billets were not painted or covered to protect them from weather (AMC 1964). An overhead crane system was used to bring long billets into the building. This crane system connected to the northeast loading dock of Building 3 (COE 1945). The billets were first nicked by making an incision on the surface using an oxygen-rich acetylene torch at one of four nicking machines. The nicked steel was then transferred to one of eight hydraulic breaking machines that finished the cutting operation. Three saw benches, and four grinding machines were used at Building 1 to cut and prepare the billets for forging. Hydraulic breaking machines were used. The breaking machines were sitting inside pits that collected motor oil, hydraulic oil, metal fines, iron scale, and debris. The pits drained to the south of the building into the sewer system. Cut billets were quenched with water. Dust collectors with vent hoods were located directly above the nicking machines and directed fumes and fine metallic particulates into dust collectors located inside the building. Ventilators were located next to the saw and grinding machines. Only liquid waste consisting of wash water and flushing water from trench cleaning was pumped to the facility sewer system (USATHAMA 1979).

Building 1 characteristics, historical use, historical processes, and hazardous material information are summarized in the table below.

BUILDING 1: BILLET CUTTING BUILDING	
Building Characteristics	
Area	8,770 ft^2
Style	One story

BUILDING 1: BILLET CUTTING BUILDING (Continued)	
Construction Materials	Building 1 is a steel framework and roof truss building with corrugated asbestos siding. The floor is reinforced concrete. The roof is precast concrete slab deck with a pitch felt and gravel surface.
Construction Date	Summer 1944
Historical Use	
Occupants/Lessees	1944 to 1983: SLAAP (105-mm howitzer shell production)
Operational Periods	1944 to 1945: 105-mm Howitzer shell production 1952 to 1954: 105-mm Howitzer shell production 1966 to 1969: 105-mm Howitzer shell production
Historical Process	
Process Description	Long steel billets or bars were cut into prescribed lengths using a nicking and breaking method. Billets were nicked using acetylene torches. Hydraulic systems were employed in breaking operations. Spray and quench operations used water for cooling in Building 1. The steel billets were stored in concrete and H-beam racks east and west of the building. After inspection, the billets were trucked to Building 2. Fine metallic particles from dust collectors were recycled (USATHMA 1979).
Process Machinery	Process machinery included billet nicking machines, grinders, a conveyer, hydraulic breaking machines, a saw sharpener, dust collectors, exhaust fans, self-propelled electric cranes, unit ventilators, pits under hydraulic breaking machines, a pit with process water discharge, and a pit with an acetylene drip pot.
Process Utilities	Process utilities included water, steam, compressed air, acetylene gas, oxygen gas, and electricity.
Hazardous Material Information	
Possible Hazardous Materials Used	Acetylene, quench water, cooling oil, hydraulic oil, machine lubricants, and degreasers
Hazardous Material Storage and Usage Areas	Pits under hydraulic break machines, a pit with process water discharge, and a pit with an acetylene drip pot
Hazardous Material Off-Loading Areas	Pits under hydraulic break machines, a pit with an acetylene drip pot and the connector sewer, and a pit with process water discharges to the sewer

Building 2, Forge Building

Building 2 was the forge building. Figure 6-6 shows major equipment areas in Buildings 2, 8 and 8A, and 11, 11A, and 11B. Building 2 housed 10 identical gas- and oil-fired rotary furnaces for slug heating and forging, 5 in each half of the building. The cut billets were fed to the rotary furnaces. Each furnace was equipped with a rectangular skid conveyor that transferred hot billet to the sizing and descaling units. The billets were then transported to the piercing presses, where a cup was first formed through hydraulic force. Each furnace had two piercing presses. The billets were then transferred to the hydraulic presses and draw benches, where they were pushed against a series of ring dies whose diameters diminish as the billet is pushed through. After drawing, the formed billet was inspected and cut to length at the hot cut-off machine. Each furnace system also had one cut-off machine. The shells were then transferred by the cooling conveyor to the water quench tanks. A descaling tank was located in the middle western half of the building. After cooling, the shells were mechanically conveyed to the second floor of Building 3 by an elevated covered bridge that connects these two buildings.

Two sets of hydraulic accumulators on each side of Building 2 each with 10 hydraulic pumps supplied hydraulic oil only to the rotary furnaces. Hydraulic oil for these two systems was supplied from two elevated 5,000-gallon tanks in the middle sections of the building. The piercing presses and draw benches had self-contained hydraulic systems independent of the rotary furnaces. Natural gas was supplied by an underground utility supply system. Fuel oil No. 6 was supplied by Buildings 8 and 8A through an underground fuel line. Each furnace had a dedicated oil fuel line that came through the floor near an I-beam next to the furnace.

Building 2 characteristics, historical use, historical processes, and hazardous material information are summarized in the table below.

BUILDING 2: FORGE BUILDING	
Building Characteristics	
Area	First Floor: 73,095 ft^2 Second Floor (Switching Room): 792 ft^2 Third Floor (Machine Balconies): 2,964 ft^2 Fourth Floor (Catwalks): 1,803 ft^2 Fifth Floor (Locker Rooms): 1,701 ft^2
Style	Five stories
Construction Materials	Building 2 has a steel frame and roof trusses on reinforced concrete piers, corrugated asbestos siding, and an asbestos-covered metal roof.
Construction Date	1944
Historical Use	
Occupants/Lessees	1944 to 1983: SLAAP (105-mm Howitzer shell production)
Operational Periods	1944 to 1945: 105-mm Howitzer shell production 1952 to 1954: 105-mm Howitzer shell production 1966 to 1969: 105-mm Howitzer shell production

BUILDING 2: FORGE BUILDING (Continued)	
Historical Process	
Process Description	From 1944 to 1969, Building 2 was used for 105-mm Howitzer shell production. The building contained 10 gas- and oil-fired rotary furnaces used for slug heating and forging. Cut steel billets from Building 1 were forged into hollow cylinders. After forging, the billets were cooled by water spraying and quenching. Various hydraulic systems were also used in the production process.
Process Machinery	Process machinery included rotary furnaces, piercing presses, sizing and descaling units, hydraulic draw benches, conveyors, accumulators, air hammers, cooling tanks, oil heaters, cranes, metal grinders, transformers, and air compressor motors and cylinders.
Utility Lines	Process utilities included electricity, water, fuel oil, compressed air, steam, and natural gas.
Hazardous Material Information	
Possible Hazardous Materials Used	Hydraulic and fuel oils, solvents (toluene), asbestos, LBP, quench water, and machine lubricant oils
Hazardous Material Storage and Usage Areas	First Floor: A fuel oil distribution system, hydraulic oil systems, and cooling tanks Second Floor: Two transformers and switches Outside: An 10,000-gallon regular (leaded) gasoline UST and dispenser (abandoned and filled with sand in 1959; removed in 1992)
Hazardous Material Off-Loading Areas	The UST was filled using a fill port on top of the tank. Fuel oil was off-loaded into pipes contained in loading pits. These pits were located north of Building 2 from 1944 to 1958 and east of the building from 1958 to 1969.

Building 3, Machining Building

The first and second floors in Building 3 were used for machining operations. Figures 6-7 through 6-10 show areas in Building 3 where major equipment was located in the basement, first floor, second floor, and roof, respectively. The building housed various lathe operations; hydraulic presses; conveyors; air-driven machinery for steel cutting, shaping, and finishing; and metal preservative operations. Other equipment included welding machines; machine, electrical, and carpenter shops; and a small automotive shop. A self-contained liquid storage area was located on the first floor that stored various oils, solvents, and chemicals. As of Jan 69, the following oils, greases, and process fluids were used:

Material	Possible Areas of Use	Possible Final Disposition
MR 186 hot forging compound	*Buildings 1 and 2*	*Could have been consumed in process*
Molyshield grease – Alubo	*Buildings 1, 2, 3, and 4*	*Could have been consumed in process*
MX-2 Hi-Temperature grease	*Buildings 1, 2, and 3*	*Could have been consumed in process*
Coolex # 25 coolant	*Building 3 machining area*	*Off-site disposal*
GM-3 cold hosing compound	*Buildings 1 and 2*	*Discharged to sewer*
Spindle oil	*Building 3*	*Could have been consumed in process*
Various lubricating oils (Regal, Mobil, and Shell)	*Sitewide*	*Off-site disposal*
Hydraulic oil General Motors Specification 16A	*Sitewide*	*Off-site disposal*
Ecnogrind	*Buildings 1 and 3*	*Unknown*
Hot forging compound	*Buildings 1 and 2*	*Could have been consumed in process*
Thinner (toluol used at rate of 45,000 liters per month)	*Building 3 painting area*	*Used as solvent, shell cleaner prior to shell painting, and paint thinner; most toluene could have evaporated; off-site disposal of residues*
Enamel 1T-E-516 (used at rate of 159,000 liters per month)	*Building 3 painting area*	*Off-site disposal of dried residues*
Primer MIL-P-223332A (used at rate of 36,000 liters per month)	*Building 3 painting area*	*Off-site disposal of dried residues*
Corrosion-preventive phosphoric acid (used at rate of 2,500 liters per month)	*Building 3*	*Could have been consumed in process.*

The following discussion of Building 3 processes is organized to follow the flow of production.

Figure 6-9 shows equipment areas on the second floor of Building 3. Fourteen furnaces were located between I-beam rows 28A through 43. Rough machining equipment was also located on the second floor of Building 3. Forged shells would be put through the bore nose or Sundstrand lathe (between I-beam Rows 11A and 14) followed by shot blasting (between I-beam Rows 14 and 17). The shells would progress through the machining process from west to east, ending at the annealing furnaces at the east end of the building. Center lathes were located between I-beam rows 18 and 20, and the rough-turning gross lathe was located between I-beam Rows 21 through 25.

Figure 6-8 shows the location of major equipment on the first floor of Building 3. A paint stripping room was located on the east end of the building north of the garage. Quench oil tanks used to quench the shells after heat treatment in the annealing furnaces were located west of the paint stripping room inside Building 3. Shell washing was conducted before painting, which was conducted in paint booths

BUILDING 3: MACHINING BUILDING (Continued)	
Historical Use	
Occupants/Lessees	1941 to 1944: SLOP (0.30-caliber munition production) 1944 to 1983: SLAAP (105-mm Howitzer shell production) 1985 to 1996: AVSCOM (office space)
Operational Periods	1941 to 1944: 0.30-caliber munition production 1944 to 1945: 105-mm Howitzer shell production 1952 to 1954: 105-mm Howitzer shell production 1966 to 1969: 105-mm Howitzer shell production 1985 to 1996: Office space
Historical Process	
Process Description	From 1941 to 1944, Building 3 was used to manufacture 0.30-caliber ammunition. In 1944, the building was converted into a machining building for 105-mm Howitzer shell production. Processes completed in Building 3 consisted of shell shaping, heat treating, cleaning, painting, and packaging for shipment. Metal chips and fragments produced as a result of the shell machining process were collected on the first and second floors and disposed of in the chip chute. The chip chute is an open chute along the north wall that opened to the basement. Metal chips and fragments along with soluble oil were collected in the basement of Building 3. From the basement, the metal chips were transferred to a railcar by conveyor for off-site disposal. Fine metallic particles from dust collectors were recycled (USATHMA 1979).
Process Machinery	Process machinery included lathes, drill presses, milling machines, grinders, heat-treating furnaces, wash racks, welders, shapers, shot-blasting equipment, paint spray booths, transformers, air compressors, and auxiliary equipment (dust collection devices, elevators, and conveyors)
Process Utilities	Process utilities included water, steam, compressed air, soluble oil, quench oil, paint, natural gas, telephone service, and electricity.
Hazardous Material Information	
Possible Hazardous Materials Used	Cutting (soluble) oil, quench oil (No. 6 fuel oil), hydraulic oil, solvents (toluene), asbestos, LBP, and pesticides

BUILDING 3: MACHINING BUILDING (Continued)		
Hazardous Material Storage and Usage Areas	Basement:	Chip chute 6-inch-diameter quench oil lines to sludge tank Transformer vaults Quench oil pump station
	First Floor:	Cutting (soluble) oil distribution system Soluble oil and mixing room Oil drum storage area 14 quench oil tanks Paint storage room (including tanks and drums) Hydraulic oil reclaiming unit Five wash racks Five paint spray booths Paint stripping room
	Second Floor:	Cutting oil distribution system Heat treating quench oil
Hazardous Material Off-Loading Areas	The quench oil USTs at Building 8 had remote fill capability from railroad tracks on the northeast side of Building 3.	

Building 4, Air Compressor Building

Building 4 was the air compressor building. Five compressors were connected to ten air intake lines, two for each compressor. The intake lines were located at the south wall of Building 4. Figures 6-11 and 6-12 show major equipment in the basement and ground level of Building 4. Individual air filter systems were connected to each air intake outside the building. The intakes entered the building beneath the floor into the compressors. Each compressor was equipped with an intercooler and aftercooler (located in a pit below the floor level). Five air receivers were aligned outside the north wall of Building 4. A cable room and vault are located in the western portion of the basement of Building 4.

Building 4 characteristics, historical use, historical processes, and hazardous material information are summarized in the table below.

BUILDINGS 9 AND 9A THROUGH 9D: ACETYLENE GENERATION AREA (Continued)	
Historical Use	
Occupants/Lessees	1944 to 1983: SLAAP (105-mm Howitzer shell production)
Operational Periods	1941 to 1944: Smokeless powder storage and canning 1944 to 1945: 105-mm Howitzer shell production 1952 to 1954: 105-mm Howitzer shell production 1966 to 1969: 105-mm Howitzer shell production
Historical Process	
Process Description	During shell production operations, the Acetylene Generation Area supported acetylene production for SLAAP. According to historical records, acetylene was generated by mixing calcium carbide and water. The reaction was contained in four acetylene generators in Building 9. Acetylene was then distributed through underground piping to Buildings 2 and 3. A byproduct of this reaction is a calcium hydroxide slurry. The caustic hydroxide slurry was stored in two sludge pits located in Building 9 until it was transported off site by contractors.
Process Machinery	Process machinery included acetylene generators, pumps, a cold oxygen convertor, and piping.
Process Utilities	Process utilities included acetylene, water, compressed air, and electricity.
Hazardous Material Information	
Possible Hazardous Materials Used	Smokeless powder, calcium carbide (based on reactivity and flammability), machining cooling oil, sludges, ACM, and LBP
Hazardous Material Storage and Usage Areas	Building 9: Smokeless powder, drip pots under acetylene generators Building 9A: Storehouse for calcium carbide Building 9B: Sludge pits with a sewer outfall Building 9C: AST for oxygen Building 9D: Cold oxygen convertor
Hazardous Material Off-Loading Areas	Sludges were pumped into trucks through a piping system installed on the north side of the Sludge Pits. The Sludge Pits were connected to the sewer system by underground piping.

Building 10, Quench Oil Storage Tanks

Building 10 was a series of tanks installed to increase production of 105-mm Howitzer shells. Figure 6-1 depicts these tanks. The three quench oil tanks and the quench oil sludge pit were located outdoors in front of the east end of Building 3 and supplied cooling oil (No. 6 fuel oil) to 14 quench oil tanks located on the first floor of the east section of Building 3.

Building 10 characteristics, historical use, historical processes, and hazardous material information are summarized in the table below.

8.5 BUILDING 5: HEADQUARTERS AND OFFICE BUILDING

Building 5 is vacant. Building 5 was originally used for loading powder into 0.30-caliber ammunition. It was converted to office space during 105-millimeter shell production. The first and second floors of Building 5 were renovated and upgraded as office space in 1984. The only remaining office equipment in the building are rolls of telephone wire pulled from the sockets in the walls. Fluorescent light ballasts are located throughout the first and second floor of Building 5. The penthouse of Building 5 houses elevator machinery for the freight elevator, and the basement of Building 5 houses three transformers and a heating system.

SUMMARY OF SITE INSPECTION OBSERVATIONS FOR BUILDING 5		
Location	**Pertinent Observations**	**Photograph Number**
Building 5, Exterior	Corrugated sheeting containing potential ACM is present on the exterior of the building.	5-1, 5-2, 5-3
Building 5, Basement	Transformers potentially containing PCBs are located in the basement.	5-8, 5-9
	A heating system aboveground storage tank (AST) and pipes in the basement are insulated with ACM-like material.	5-10
Building 5, First Floor	Fluorescent light ballasts potentially containing PCBs are located throughout the first floor.	This photograph did not develop well.
	An elevator switchbox potentially containing PCBs is located near the freight elevator.	5-4, 5-5
	Debris on the first floor includes telephone wires pulled from sockets.	This photograph did not develop well.
Building 5, Second Floor	Fluorescent light ballasts potentially containing PCBs are located throughout the second floor.	This photograph did not develop well.
	Debris on the second floor includes telephone wires pulled from sockets.	This photograph did not develop well.
Building 5, Penthouse	Elevator machinery with oil stains is located in the penthouse. The transformer for the elevator potentially contains PCBs.	5-6
	Paint chips, possibly lead-based, were located in the stairway to the penthouse.	5-7

8.6 BUILDING 6: WEST OFFICE AND LABORATORY BUILDING

Building 6 is vacant. The first and second floors of Building 6 were renovated and upgraded as office space in 1984. The only remaining office equipment in the building are rolls of telephone wire pulled from the sockets in the walls. An open hearth is located in a small room on the first floor of Building 6,

- Applied Environmental Services, Inc. 1993. "Results of Lead Wipe Sampling in PF&E Office and Storage Areas." M92-11-109.03. 12 Apr.
- U.S. Geological Survey (USGS). 1993. 7.5-Minute Series Topographic Map of the Missouri Clayton Quadrangle.
- Dames & Moore. 1994a. "Building 3 Basement Characterization Report." 30 Aug.
- Dames & Moore. 1994b. "Remediation Design and Development Report." Prepared for PFE. St. Louis, Missouri. Job No. 06702-113-2090. 19 Sep.
- Rust Remedial Services, Inc. 1994. "Final Report of Analytical Results, St. Louis Army Ammunition Plant, PCB Decontamination and Testing of Building 3 Project, St. Louis, Missouri." 29 Aug.
- Woodward Clyde-Consultants. 1996. "Health-Based Risk Assessment, Building No. 3, Army Ammunition Plant, St. Louis, Missouri." Jun.

9.2 UNDERGROUND STORAGE TANKS

Review of documents and interviews of personnel related to the UST characterization and removal at SLAAP revealed that eight USTs were installed and used though not at the same time. The USTs included three steel quench oil tanks; one concrete sludge pit; two steel gasoline tanks; and two gasoline tanks of unknown location. The quench oil tanks ranged in capacity from 14,000 to 15,000 gallons; the sludge pit had a volume of approximately 10,000 gallons; and the four gasoline tanks had volumes of approximately 6,000, 10,000 and 11,000 gallons and one of unknown volume.

The three steel quench oil tanks (tanks 15, 17, and 87) were installed adjacent to the east wall of Building 3 during the Building 3 addition construction in 1944 (see Figure 6-1). The tanks contained No. 6 fuel oil used as quench oil in Building 3 in the 105-mm shell production process from 1944 to 1969. The concrete sludge pit was installed next to the quench oil tanks in 1944 and received used quench oil from Building 3 (see Figure 6-7). This pit is identified as the "quench oil sludge tank" in historical as-built drawings. Residue settled out of the used quench oil in the pit before the oil was reused.

The gasoline UST of unknown volume was installed in 1941 but replaced by tank 105. Removal and replacement records for that UST could not be located. Tank 105, a 6,000-gallon gasoline UST, was installed east of Building 3 (Figure 6-1). The 11,000-gallon UST was replaced by tank 101 in 1945. Tank 101, a 10,000-gallon gasoline UST, was installed west of Building 2 (Figure 6-1). No information documents the final disposition of the 11,000-gallon UST.

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According to installation records, the 10,000-gallon UST west of Building 2 was abandoned and filled with sand in 1959. In 1969, when 105-mm shell production at SLAAP ceased, the contents of the remaining five USTs were removed and they were filled with water. In Sep 89, COE investigated the six known USTs at SLAAP. COE inventoried the USTs and recommended that all six tanks be properly removed or closed.

An investigation of the six USTs was conducted in 1992 to prepare for their removal. The investigation included sampling of the UST contents, installation of 12 soil borings, and collection of subsurface soil samples. Analysis of the UST contents revealed that each quench oil tank contained mostly water, with 1 to 2 percent oil and sludge material. The sludge pit contained water and approximately 5 percent oil and sludge. Gasoline tank 105 was filled almost entirely (99.9 percent) with water, and gasoline tank 101 contained a mixture of 25 percent water and 75 percent coal-like fines. Liquids in the USTs were analyzed and did not contain PCBs. Analysis of the solids in tank 101 revealed metals at relatively low concentrations. The J.D. Chelan report interprets the metal concentrations as "below toxic levels" (Chelan 1992). Analysis of subsurface soil samples revealed total petroleum hydrocarbon (TPH) concentrations ranging from 11 to 6,530 parts per million (ppm). The highest TPH concentrations were detected in samples collected from 13 to 17 feet bgs around the quench oil tanks. A TPH concentration of 491 ppm was also detected in a sample collected near gasoline tank 105 at 7 feet bgs. Metals were detected at relatively low concentrations in subsurface soil samples. Subsurface soil samples collected around the gasoline USTs did not contain detectable concentrations of benzene, toluene, ethylbenzene or xylene (BTEX) compounds. In addition, one surface soil sample collected from a pipe north of gasoline tank 105 contained a red "solvent-like" material. The pipe did not appear to be connected to the UST. Analysis of the sample revealed BTEX compounds at a concentration of 477,200 ppm. This pipe led from the gasoline UST to the gasoline dispensing pump and is embedded in the structural concrete foundation (Tetra Tech 2000).

UST removal activities began in Nov 92. Prior to the removal, approximately 2,300 gallons of water and oil was pumped from the tanks and transported to an oil recycling facility. The six USTs and 1,500 cubic yards of contaminated soil were removed and disposed of. Analysis of soil confirmation samples collected from the excavations indicated that further remedial action was required. A corrective action plan (CAP) was submitted to MDNR on 16 Apr 93. The final version of the CAP was approved by MDNR on 03 Jun 93. The final CAP proposed to (1) remove and properly dispose of approximately 29,000 gallons of water that had collected in the open excavations; (2) excavate additional soil from the

- Oil staining is present along the far east foundation wall, on the floor, and on support columns in the vicinity of the quench oil pump room in the basement. Soil beneath the oil pump room and sumps may be contaminated.

- Friable ACM-like material and metal shavings potentially contaminated with PCBs were observed on the basement floor.

- LBP is present at this building.

- Oil is floating on top of water on the floor in the central portion of the basement.

- A steel separator tank was identified in the south-central portion of the basement. The tank is filled with a dried, oxidized material that may be of environmental concern.

- The former transformer vault in the northwest corner of the basement contains spilled oil. This oil may contain PCBs. Other transformer vaults in the basement may also need testing for PCBs.

- The chip chute load-out area is known to be contaminated with PCBs.

- Cracks in concrete caps were observed on the first and second floors.

- Former paint mixing and paint booths areas are located on the first floor.

- Paint used to seal the steel structures on the first floor is cracking and peeling.

- A solvent area was identified in the Building 3 plans. The solvent area drain is connected to the sewer system, and water was identified in this drain.

- Fluorescent light fixtures that may contain PCBs were identified in a room on the first floor.

- A room on the second floor contains an emergency power supply unit. This unit may contain lead-acid or nickel-cadmium batteries.

- Spilled oil from leaking motors was identified in each of the penthouses. The oil may contain PCBs.

- A remote quench oil fill-pipe is located near the northeast corner of Building 3.

- Explosives and/or metals may have contaminated air ducts in Building 3 during the SLOP era.

10.2.4 Building 4: Air Compressor Building

Possible areas of environmental concern identified at Building 4 are shown in Figure 10-4 and listed below.

- Rubble and debris used to fill the pits below the air compressors. Possible PCB-contaminated compressor oils may have leaked into the pits below the compressors.

- Soils beneath the pit may be contaminated.
- Electrical equipment may contain PCB oil.
- Fluorescent light ballasts are located throughout the building.
- An outdoor transformer storage area was identified.

10.2.5 Building 5: Headquarters and Office Building

Possible areas of environmental concern identified at Building 5 are shown in Figure 10-5 and listed below.

- Possible areas of explosive and propellant spills were identified.
- Friable ACM-like material is located in the basement and at the tunnel that connects this building to Building 3.
- Fluorescent lamp ballasts were identified.
- LBP chips may be located throughout the building.
- Former oil storage Building 202 J was identified.
- Possible PCB-contaminated oil spilled from elevator machinery in the penthouse.
- Explosives and/or metals may have contaminated air ducts in Building 5 during the SLOP era.

10.2.6 Building 6: West Office and Laboratory Building

Possible areas of environmental concern identified at Building 6 are shown in Figure 10-5 and listed below.

- Possible areas of explosive and propellant spills were identified.
- Possible friable ACM-like material is located in the basement and at the tunnel that connects this building to Building 3.
- LBP chips located throughout the building.
- A laboratory area (chemical storage, dark room, etching, and ash in the hearth) was identified.

- The tunnel system that connects this building to the CONTICO facility may contain PCB contamination.
- Former oils storage Building 202 K was identified.
- Fluorescent lamp ballasts located may be throughout the building.
- Explosives and/or metals may have contaminated air ducts in Building 6 during the SLOP era.

10.2.7 Buildings 7 and 7A: Water Pumphouse and Cooling Tower

Possible areas of environmental concern identified at Buildings 7 and 7A consist of possible soil contamination under the cooling tower blowdown discharge, ACM in the roofing, and possible LBP (see Figure 10-4).

10.2.8 Buildings 8 and 8A: Fuel Storage Area and Oil Pumphouse

Buildings 8 and 8A have been removed; however, the locations of these buildings are possible areas of environmental concern. The first location of Building 8 and a portion of Building 8A was excavated during construction of Interstate 70. The highway was constructed at an elevation approximately 70 to 80 feet lower than the original ground surface. Therefore, soil potentially impacted by operations in Buildings 8 and 8A were likely removed and do not present an environmental concern. However, the former fuel oil off-loading area remains, and this area is of possible environmental concern. In addition, because soil was not removed from the second location of Buildings 8 and 8A, the presence of the fuel lines, and the "dirty sump" associated with the second Building 8 and 8A location, the former fuel oil off-loading area is of possible environmental concern (see Figure 10-2).

10.2.9 Buildings 9 and 9A through 9D: Acetylene Generation Area

The sludge pits in the Acetylene Generation Area constitute a possible area of environmental concern. This area is also where former Buildings 202 F and 202 H were located (see Figure 10-3). No records were found concerning the demolition of the Acetylene Generation Area.

11.1.1 Lithologic Soil Boring Advancement

Between 9 and 12 Jul 99, nine soil borings (SWMW-1 through SWMW-7, 2MW-1, and 10MW-1) were advanced to characterize the site-specific lithology. The soil borings were advanced to 23 to 38 feet bgs. The soil borings were advanced in accordance with the methods described in Appendix G.

11.1.2 Monitoring Well Installation

Seven sitewide monitoring wells (SWMW-1 through SWMW-7) were installed to characterize groundwater in the shallow aquifer across the installation. Two monitoring wells (2MW-1 and 10MW-1) were installed to characterize groundwater at building-specific possible areas of environmental concern. Construction details for monitoring wells SWMW-1 through SWMW-7, 2MW-1, and 10MW-1 are summarized below.

Monitoring Well Number	Top of Casing Elevation	Top of Ground Elevation	Screened Interval	Filter Pack Interval
SWMW-1	533.25	533.30	502.97 - 512.97	505.97 - 512.0
SWMW-2	535.10	535.36	529.9 - 514.9	532.9 - 515
SWMW-3	535.63	535.92	530.53 - 515.53	532.53 - 515
SWMW-4	536.19	536.26	523.84 - 508.84	526.59 - 507
SWMW-5	532.69	533.01	522.74 - 507.74	525.59 - 507
SWMW-6	526.91	527.05	518.96 - 508.96	521.72 - 568
SWMW-7	525.72	526.17	521.75 - 506.75	520.25 - 504.27
2MW-1	532.76	532.80	524.66 - 514.66	527.41 - 515
10MW-1	535.39	535.56	531.65 - 516.65	533.65 - 516
Note: All values are presented in feet above mean sea level.				

The monitoring wells were installed to collect groundwater flow and groundwater quality data. Each well was developed using a submersible pump with dedicated Tygon tubing. Based on geologic information acquired from the boring logs, the groundwater in all monitoring wells represents the unconfined aquifer across the site. Additional information may be found during the site-specific EBS that will better define the characteristics of the aquifer. The wells were developed in accordance with MDNR guidelines by removing enough well volume to lower the turbidity of the purge water to below 5 turbidity units. Water generated from well development was placed in 55-gallon drums.

11.2.1 Building 1 Sampling Activities

Possible areas of environmental concern identified at Building 1 during the records search and site inspection include the following:

- Electrical equipment possibly containing PCBs
- Spilled oil
- Concrete-filled hydraulic oil pits, sumps, and floor drains
- Two pits connected to the sewer system
- Possible metals contamination in outdoor storage areas

Therefore, the soil and wipe sampling activities summarized below were conducted at Building 1.

Sample Number	Sampling Location	Matrix	Analytical Parameters			
			VOCs	SVOCs	Metals	PCBs
1SB-1 and 1SB-1A	West concrete pit connected to sewer system	Soil	✓	✓	✓	✓
1SB-2 and 1SB-2A	East concrete pit connected to sewer system	Soil	✓	✓	✓	✓
1SB-3	East metal storage area	Soil			✓	
1SB-4	West metal storage area	Soil			✓	
1SW-1	Electrical equipment oil stain	Wipe				✓
1SW-2	Miscellaneous oil stain	Wipe				✓

Material in the sumps located within the building has been covered in concrete. Therefore, it is unlikely that this material currently poses a threat to human health or the environment and no samples were collected from the concrete-filled sumps. If demolition activities of these sumps take place in the future, a thorough characterization of the sump area will be necessary.

11.2.2 Building 2 Sampling Activities

Possible areas of environmental concern identified at Building 2 include the following:

- The fuel oil pipe run from Building 2 that originally extended north to Building 8; when the fuel oil ASTs were moved in 1958, an additional piping run was installed that

- Outdoor transformer storage area

Therefore, the soil and wipe sampling activities summarized below were conducted at Building 4.

Sample Number	Sampling Location	Matrix	Analytical Parameters			
			VOCs	SVOCs	Metals	PCBs
4SS-1	Pit below air compressor	Soil	✓	✓	✓	✓
4SW-1	Indoor electrical equipment oil stain	Wipe				✓
4SW-1A	Outdoor transformer storage area (west)	Wipe				✓
4SW-1B	Outdoor transformer storage area (east)	Wipe				✓
4SB-1	Former transformer pad	Soil	✓	✓	✓	✓

11.2.5 Building 5 Sampling Activities

Possible areas of environmental concern identified at Building 5 include the following:

- Friable ACM-like material in the basement
- Fluorescent lamp ballasts
- LBP chips
- Possible spilled explosives and ammunition-related chemicals
- Possible PCB-contaminated oil spilled from elevator machinery in the penthouse

Therefore, the soil and wipe sampling activities summarized below were conducted at Building 5.

Sample Number	Sampling Location	Matrix	Analytical Parameters					
			VOCs	SVOCs	Metals	PCBs	Nitroaromatics, TNT, and Explosives	Perchlorates, Nitrates, and Phosphorus
5SW-1	Elevator penthouse	Wipe				✓		
5SW-A	Elevator penthouse (Blank)	Wipe				✓		
5SW-1A	Elevator penthouse	Wipe				✓		
5SW-1B	Elevator penthouse	Wipe				✓		
5SW-1C	Elevator penthouse	Wipe				✓		

Sample Number	Sampling Location	Matrix	Analytical Parameters					
			VOCs	SVOCs	Metals	PCBs	Nitroaro-matics, TNT, and Explosives	Perchlorates, Nitrates, and Phosphorus
5SB-1	Grassy area south of Building 5	Soil	✓	✓	✓	✓	✓	✓
5SB-2	Grassy area south of Building 5	Soil	✓	✓	✓	✓	✓	✓

11.2.6 Building 6 Sampling Activities

Possible areas of environmental concern identified at Building 6 include the following:

- Ash-filled hearth
- Possible PCB contamination in the tunnel system used to convey utility lines
- Chemical spills that occurred during small arms manufacturing.

Therefore, the soil, wipe and ash sampling activities summarized below were conducted at Building 6.

Sample Number	Sampling Location	Matrix	Analytical Parameters					
			VOCs	SVOCs	Metals	PCBs	Nitroaro-matics, TNT, and Explosives	Perchlorates, Nitrates, and Phosphorus
6SS-1	Open hearth	Ash			✓			
6SW-B1	Tunnel area	Wipe				✓		
6SW-B2	Tunnel area	Wipe				✓		
6SW-B3	Tunnel area	Wipe				✓		
6SB-1	Grassy area south of Building 6	Soil	✓	✓	✓	✓	✓	✓
6SB-2	Grassy area south of Building 6	Soil	✓	✓	✓	✓	✓	✓

12.2.2 Building 2 Results

Soil boring 2SB-1 and monitoring well 2MW-1 were sampled at Building 2. Also, two sump water samples, one wipe sample, and two surface soil samples were collected. The soil boring and monitoring well were sampled to assess subsurface media near the end of the fuel oil pipeline system. The sump water samples (2SP-1 and 2Sump) were collected to assess the quality of water in sumps present in Building 2. One sump was sampled on two occasions for different parameters. The wipe sample (2SW-1) was collected to assess the oil stain in the northeast corner of the building near the former location of a rotary furnace. The location is shown on Figure 12-4. Two surface soil samples (2SS-1 and 2SS-2) were collected to assess soil quality in areas near the former rotary furnaces. Building 2 sampling locations are depicted in Figure 12-4. Building 2 soil boring and headspace analysis results are summarized below.

BUILDING 2 SOIL BORING RESULTS						
Boring Number	**Total Depth (feet bgs)**	**Fill (feet bgs)**	**Clayey Silt (feet bgs)**	**Silty Clay (feet bgs)**	**Depth to Groundwater (feet bgs)**	**Sampled Interval and Analytical Parameters**
2SB-1	20	0-3	3-13	13-20	NE	1 to 2 and 2 to 3 feet bgs for SVOCs and PCBs; 1.5 and 2.5 feet bgs for VOCs

Note:
NE = Not encountered

BUILDING 2 HEADSPACE ANALYSIS RESULTS										
Boring Number	**1 foot bgs**	**3 feet bgs**	**5 feet bgs**	**7 feet bgs**	**9 feet bgs**	**11 feet bgs**	**13 feet bgs**	**15 feet bgs**	**17 feet bgs**	**19 feet bgs**
2SB-1	NM	11	8	8	7.5	6	5.5	4	1	0

Notes:
NM = Not measured
All values are presented in ppm.

Building 2 sump water sample analytical results are summarized in the table below.

BUILDING 2 SUMP WATER SAMPLE ANALYTICAL RESULTS				
Parameter	2SP-1[a] (VOC SVOC PCB)	2Sump[a] (Metals)	CALM	EPA Region IX PRGs
			Groundwater Target Concentration	Tap Water PRG
Antimony	NA	9.0	6	15
Cadmium	NA	1.4	5	18
Chromium	NA	10.3	100	110
Copper	NA	85.6	1,000	1,400
Lead	NA	131	15	NL
Selenium	NA	ND	50	180
Thallium	NA	ND	2	2.4
Zinc	NA	347	2,000	1,100
1,1-Dichloroethane	10	NA	NL	810
1,1,1-Trichloroethane	1.6	NA	200	540

Notes:
NA = Not analyzed (see "a" below)
ND = Not detected
NL = Not listed

a Samples 2SP-1 and 2Sump were collected from one sump during different sampling events.
All values are presented in µg/L.

Building 2 soil and groundwater sample analytical results and a comparison of these results to CALM and EPA Region IX PRGs are summarized below.

BUILDING 2 SOIL SAMPLE ANALYTICAL RESULTS FOR METALS AND PCBs					
Analytical Parameter	Sample Numbers		CALM		
			Ingestion/Dermal Contact Inhalation Pathway		Leaching to Groundwater Pathway
	2SS-1	2SS-2	Scenario A	Scenario C	
Antimony	ND	ND	3.7	12	5.3
Cadmium	1.85	ND	87	300	11
Chromium	43.6	131	1,300	2,700	38
Copper	86.1	1,210	1,100	4,700	NL
Lead	1,450	267	260	660	NL
Selenium	1.46	3.81	300	970	4.37
Thallium	ND	ND	17	61	29.1
Zinc	1,260	386	38,000	420,000	73,600

The sample collected from 3SB-3 also contained a benzo(a)pyrene and PCB at concentrations that exceeded residential and industrial PRGs. The PCB concentration was 830 mg/kg. This sample also contained benzo(a)anthracene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene at concentrations exceeding residential PRGs.

The soil sample collected from soil boring 3SB-3 contained polynuclear aromatic hydrocarbons (PAH) and PCBs at concentrations exceeding CALM criteria. The most likely source of this contamination is the chip chute conveyor system used to load railroad cars.

Basement surface soil samples 3SS-1A, 3SS-17 and 3SS-18 contained PCBs at concentrations exceeding residential and industrial PRGs. The PCB concentration in surface soil sample 3SS-1 exceeded the residential PCB PRG.

12.2.4 Building 4 Results

Soil boring 4SB-1 was sampled at Building 4. Three wipe samples and one surface soil sample were also collected. Soil boring 4SB-1 was advanced at the former transformer pad location at the southwest corner of the building. The wipe samples were collected to determine the PCB content of oil spilled from electrical equipment and from an oil stove at the building. The surface soil sample was collected from a pit beneath the former air compressor to assess soil quality. Sampling locations are depicted in Figure 12-4. Soil boring results are summarized below.

BUILDING 4 SOIL BORING RESULTS						
Boring Number	Total Depth (feet bgs)	Fill (feet bgs)	Clayey Silt (feet bgs)	Silty Clay (feet bgs)	Depth to Groundwater (feet bgs)	Sampled Interval and Analytical Parameters
4SB-1	3	0-1	1-3	NE	NE	0 to 3 feet bgs for SVOCs and PCBs; 1 foot bgs for VOCs
Note: NE = Not encountered						

Building 4 wipe sample analytical results are summarized in the table below.

Soil sample analytical results for VOCs and for SVOCs and PCBs and comparisons of these results to CALM and EPA Region IX PRGs are summarized below.

process that used fuel or quench oil. Also, no staining, petroleum odors, or headspace readings above 100 ppm were identified during boring operations. It therefore seems unlikely that petroleum contamination is the source of the benzo(a)pyrene detected. Because the benzo(a)pyrene was detected on the surface of a grassy area located in a heavily industrialized area, the most likely source of the benzo(a)pyrene is a nearby industrial process that generates air emissions. The soil sample from 5SB-2 also contained benzo(a)anthracene and benzo(b)fluoranthene at concentrations that exceed CALM Scenario A criteria.

Soil samples collected from Building 5 did not contain PCBs, VOCs, metals, perchlorates, chlorite, nitrates or organic explosives at concentrations exceeding PRGs. Boring samples from 5SB-1 and 5SB-2 contained benzo(a)pyrene at concentrations exceeding the residential PRGs and the residential and industrial PRGs, respectively. Samples from 5SB-2 also contained benzo(a)anthracene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene at concentrations exceeding residential PRGs.

12.2.6 Building 6 Results

Soil borings 6SB-1 and 6SB-2 were sampled at Building 6. Also, one surface soil sample (6SS-1) and three wipe samples (6SW-B1, 6SW-B2, and 6SW-B3) were collected from Building 6. The soil borings were completed and sampled to assess the quality of soil south of Building 6. The surface soil sample was collected to assess the ash in the open hearth on the first floor of the building. The wipe samples were collected to determine whether PCBs are present in the tunnel that connects SLOP to the basement of Building 6. The Building 6 sampling locations are depicted in Figure 12-4. Soil boring and headspace analysis results are summarized below.

BUILDING 6 SOIL BORING RESULTS						
Boring Number	Total Depth (feet bgs)	Fill (feet bgs)	Clayey Silt (feet bgs)	Silty Clay (feet bgs)	Depth to Groundwater (feet bgs)	Sampled Interval and Analytical Parameters
6SB-1	12	0-4	4-8	8-12	9	4 to 6 feet bgs for SVOCs, PCBs, explosives, metals, phosphorus, and perchlorates; 5 feet bgs for VOCs
6SB-2	10	0-8	8-10	NE	9	2 to 4 feet bgs for SVOCs, PCBs, explosives, metals, phosphorus, and perchlorates; 3 feet bgs for VOCs
Note: NE = Not encountered						

BUILDING 6 SOIL SAMPLE ANALYTICAL RESULTS FOR SVOCs					
Analytical Parameter	Sample Numbers		EPA Region IX PRGs		
	6SB-1, 4-6	6SB-2, 2-4	Residential	Industrial	Migration to Groundwater
Anthracene	ND	0.041	22,000	100,000	21,000
Benzo(a)anthracene	0.059	0.17	0.62	2.9	2
Benzo(a)pyrene	0.061	0.150	0.062	0.29	8
Benzo(b)fluoranthene	0.065	0.4	0.62	2.9	5
Benzo(k)fluoranthene	0.042	0.098	6.2	29	49
Chrysene	0.066	0.19	62	290	160
Fluoranthene	0.11	0.3	2,300	30,000	4,200
Indeno(1,2,3-cd)pyrene	ND	0.098	0.62	2.9	14
Phenanthrene	0.06	0.21	NL	NL	NL
Pyrene	0.11	0.3	2,300	54,000	4,200
Bis(2-ethylhexyl)phthalate	0.085	ND	35	180	NL
Notes: ND = Not detected NL = Not listed All values are presented in mg/kg.					

Building 6 soil samples did not contain VOCs, SVOCs, explosives, or perchlorates at concentrations exceeding CALM criteria. Surface soil sample 6SS-1 collected from the ash in the hearth contained arsenic and lead at concentrations that exceed CALM Scenario A and C criteria and chromium at a concentration exceeding the CALM leaching to groundwater pathway criterion.

Surface soil sample 6SS-1 (hearth ash) contained elevated concentrations of arsenic, chromium, and lead. The lead concentration exceeded the residential and industrial PRGs, the arsenic concentration exceeded the residential PRG, and the chromium concentration exceeded the migration to groundwater PRG.

12.2.7 Building 7 Results

Soil boring 7SB-1 was sampled near Building 7 to 3 feet bgs in order to assess the quality of soil underneath the cooling tower blowdown discharge. This sampling location is depicted in Figure 12-4. The collected sample was only analyzed for total chromium because there was no reason to suspect VOC or SVOC contamination in that area. The soil boring result is summarized below.

BUILDING 7 SOIL BORING RESULTS			
Boring Number	Total Depth (feet bgs)	Clayey Silt (feet bgs)	Sampled Interval and Analytical Parameters
7SB-1	3	0-3	1 to 3 feet bgs for total chromium

The soil sample collected from 7SB-1 contained 26 mg/kg of chromium. This concentration does not exceed CALM or the EPA Region IX PRG criterion.

12.2.8 Building 8 and 8A Results

For Buildings 8 and 8A, 10 soil borings (8SB-1 through 8SB-10) were sampled during the first phase of field activities. Soil boring 8SB-11 was completed and sampled during the second phase of field activities. Soil borings 8SB-1 through 8SB-6 were completed to assess the quality of soil in the former fuel oil storage area. Soil borings 8SB-7 and 8SB-8 were completed to assess the quality of soil at the former "dirty sump" locations. Soil borings 8SB-9 and 8SB-10 were completed to assess the quality of soil along the fuel oil delivery lines. Soil boring 8SB-11 was completed to determine the horizontal extent of contamination visually observed in 8SB-4. Sampling locations are depicted in Figure 12-4. Soil boring and headspace analysis results are summarized below.

BUILDINGS 8 AND 8A SOIL BORING RESULTS						
Boring Number	Total Depth (feet bgs)	Fill (feet bgs)	Clayey Silt (feet bgs)	Silty Clay (feet bgs)	Depth to Groundwater (feet bgs)	Sampled Interval and Analytical Parameters
8SB-1	12	0-5.5	5.5-8	8-12	11	6 to 8 feet bgs for SVOCs and PCBs; 7 feet bgs for VOCs
8SB-2	12	0-6	NE	6-12	10	4 to 6 feet bgs for SVOCs and PCBs; 5 feet bgs for VOCs
8SB-3	12	0-5	5-12	NE	10	6 to 8 feet bgs for SVOCs and PCBs; 7 feet bgs for VOCs
8SB-4[a]	10	0-6	NE	6-10	NE	6 to 8 feet bgs for SVOCs and PCBs; 7 feet bgs for VOCs
8SB-5	12	0-5.5	NE	5.5-12	9	6 to 8 feet bgs for SVOCs and PCBs; 7 feet bgs for VOCs
8SB-6	12	0-6	NE	6-12	10	6 to 7.5 feet bgs for VOCs 6.5 feet bgs for VOCs
8SB-7	12	0-6	6-12	NE	8	6 to 8 feet bgs for SVOCs and PCBs; 7 feet bgs for VOCs
8SB-8	12	0-0.5	0.5-12	NE	7	5 to 7 feet bgs for SVOCs and PCBs; 6 feet bgs for VOCs

12.2.10 Building 10 Results

A total of six soil borings (10SB-1 through 10SB-5 and 10SB-1A) were sampled near Building 10. Soil boring 10SB-1 was converted into monitoring well 10MW-1. Soil borings 10SB-1 through 10SB-5 were completed to assess the horizontal extent of contamination from the quench oil release reported during the UST removals. At the request of EPA Region 7, soil boring 10SB-1A was completed to assess soil beneath the former quench oil sludge pit. Monitoring well 10MW-1 was installed to assess the quality of groundwater hydraulically downgradient from Building 10. Sampling locations are shown in Figure 12-4. Soil boring and headspace analysis results are summarized below.

BUILDING 10 SOIL BORING RESULTS						
Boring Number	**Total Depth (feet bgs)**	**Fill (feet bgs)**	**Clayey Silt (feet bgs)**	**Silty Clay (feet bgs)**	**Depth to Groundwater (feet bgs)**	**Sampled Interval and Analytical Parameters**
10SB-1	20	0-0.5	0.5-20	NE	6	6 to 8 feet bgs for SVOCs and PCBs; 7 feet bgs for VOCs
10SB-1A	19	0-13	13-19	NE	12	14 to 16 feet bgs for SVOCs, metals, and explosives; 15 feet bgs for VOCs
10SB-2	12	0-1	1-12	NE	9	6 to 8 feet bgs for SVOCs: 7 feet bgs for VOCs
10SB-3	12	0-2	NE	2-12	9	10 to 12 feet bgs for SVOCs: 11 feet bgs for VOCs
10SB-4	16	0-2	4-16	2-4	9	6 to 8 feet bgs for SVOCs and PCBs; 7 feet bgs for VOCs
10SB-5	12	0-3.5	3.5-12	NE	8.5	6 to 8 feet bgs for SVOCs, PCBs. and pH: 7 feet bgs for VOCs
Note: NE = Not encountered						

BUILDING 10 HEADSPACE ANALYSIS RESULTS								
Boring Number	**1 foot bgs**	**3 feet bgs**	**5 feet bgs**	**7 feet bgs**	**9 feet bgs**	**11 feet bgs**	**13 feet bgs**	**15 feet bgs**
10SB-1	19.5	24.5	18.2	22.4	22.9	13.8	18.5	18.3
10SB-1A	75	87	NM	37.5	NM	39.6	NM	68
10SB-2	NM	24.75	26.74	30.22	22.41	27.79	NS	NS
10SB-3	NM	74.03	19.21	31.41	7.05	NM	NS	NS

13.0 CONCLUSIONS AND RECOMMENDATIONS

This section summarizes conclusions drawn from the EBS findings conducted at SLAAP and presents recommendations for future activities at the installation's areas of environmental concern. Sitewide conclusions and recommendations are presented first, followed by building-specific conclusions and recommendations.

13.1 SITEWIDE CONCLUSIONS AND RECOMMENDATIONS

Conclusions and recommendations for groundwater, impact on the facility and/or adjacent properties, ACM, and LBP are presented below.

13.1.1 Conclusions and Recommendations for Sitewide Groundwater

Groundwater monitoring conducted to date is intended to establish an environmental baseline only and is not intended to be a comprehensive groundwater study. Additional groundwater sampling will be included in the site-specific EBS.

Groundwater elevation data indicate that groundwater flows onto SLAAP from the west and then flows radially off SLAAP to the north, east, and south. Additional groundwater level monitoring may be necessary at each monitoring well to better define the groundwater flow direction and rate. Preliminary groundwater flow rates measured during groundwater sampling activities indicate that saturated formations in the subsurface are not capable of supplying sufficient volumes of potable water. Groundwater samples collected from the seven sitewide monitoring wells did not contain VOCs, SVOCs, metals, explosives, PCBs, or perchlorates at concentrations that exceed either CALM groundwater target concentrations or EPA Region IX tapwater PRGs. Because the groundwater does not appear to have been impacted by SLAAP or off-site activities, groundwater does not appear to be of environmental concern.

13.1.2 Conclusions and Recommendations for ACM

The ACM survey conducted at SLAAP confirms the presence of ACM throughout the major installation buildings. The ACM survey report is included in this EBS report as Appendix K. Because the ACM poses an environmental concern, the ACM should be addressed in accordance with National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations.

13.1.3 Conclusion and Recommendations for LBP

Because of the age of the installation buildings and the confirmed presence of LBP at Building 3, LBP is apparently present in most SLAAP buildings and therefore poses an environmental concern. SLAAP buildings scheduled for transfer, renovation, or demolition should be inspected for LBP.

13.2 BUILDING-SPECIFIC CONCLUSIONS AND RECOMMENDATIONS

This section presents building-specific findings of the EBS and associated recommendations.

13.2.1 Building 1 Conclusions and Recommendations

The areas of environmental concern for Building 1 are depicted in Figure 13-1. The oil stain on the concrete below the electrical equipment contained PCBs at an elevated concentration, indicating that the electrical equipment may contain PCB-contaminated oil. Therefore, this area poses an environmental concern. The equipment is scheduled for removal. The stained concrete should be decontaminated to remove residual PCBs.

One soil sample collected from the soil boring completed near the western sewer connection and one soil sample collected from the eastern parking lot contained lead at concentrations that exceed CALM ingestion, dermal contact, and inhalation criteria and residential and industrial PRGs. Also, these soil samples contained chromium at concentrations that exceed the CALM leaching to groundwater pathway criterion, the residential PRG, and the EPA Region IX migration to groundwater soil screening level. Therefore, the areas sampled pose an environmental concern. The extent of soil contamination in these areas should be delineated, and the contaminated soil should be addressed.

The condition of the oil pits below the breaking machines is unknown. Though they were filled with crac-free concrete, the soils beneath these pits should be investigated for contamination.

In addition, miscellaneous rubbish, debris, light ballasts, and LBP chips in Building 1 should be removed. The SLAAP installation assessment report states that all sumps and industrial drains have been cleaned and flushed (USATHAMA 1979). However, based on the results of subsurface soil samples whose concentrations exceeded CALM and EPA Region IX PRGs, investigations to assess contamination beneath sumps and along subsurface conduits may be warranted.

13.2.2 Building 2 Conclusions and Recommendations

The areas of environmental concern for Building 2 are depicted in Figure 13-2. The EBS investigation of Building 2 included completion of one monitoring well and collection of two surface soil samples, one wipe sample, two sump water samples, and groundwater samples. The surface soil samples contained metals at concentrations exceeding CALM and PRG criteria. One sample also contained PCBs at a concentration exceeding the residential PRG. Therefore, soil in the building appears to pose an environmental concern. The soil should be analyzed to delineate heavy metals and PCB contamination for waste characterization parameters. Based on analytical results, the soil should be properly disposed of.

Antimony and lead were detected in the sump water samples at concentrations exceeding CALM groundwater target concentration criteria. The groundwater samples collected from the monitoring well contained 1,1-dichloroethene at concentrations exceeding that exceed the CALM groundwater target concentration. Therefore, groundwater in the Building 2 area poses an environmental concern. However, the maximum 1,1-dichloroethene concentration detected exceeds the CALM groundwater target concentration by only 49 μg/L. Also, groundwater is not in use at SLAAP or in its vicinity, and groundwater samples collected from the sitewide monitoring wells did not contain detectable concentrations of 1,1-dichloroethene. This suggests that the 1,1-dichloroethene groundwater contamination is confined to an area within SLAAP near monitoring well 2MW-1. It is therefore recommended that no additional groundwater characterization is warranted.

The wipe sample collected from an oil stain did not contain PCBs at concentrations exceeding CALM or PRG criteria. The oil stain does not appear to be hazardous and does not pose an environmental concern. The underground utility tunnel that housed the fuel oil lines from Building 8 to Building 2, including lines inside Building 2, may require sampling for parameters of concern. Additional sampling may be planned as part of the site-specific EBS work plan development.

13.2.3 Building 3 Conclusions and Recommendations

The outdoor and basement areas of environmental concern for Building 3 is shown in Figures 10-3 and 10-4, respectively. The EBS investigation of Building 3 included sampling of four soil borings and collection of 17 concrete core samples, one sump and one water drain sample, 44 wipe samples, 23 surface soil samples, and 6 air samples. Conclusions are discussed first, followed by recommendations. The soil sample collected from soil boring 3SB-3 contained PCBs and SVOCs at concentrations that exceed CALM and PRG criteria. Therefore, the 3SB-3 area is of environmental concern. The soil boring

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was completed near the conveyor that transported metal chips from the chip chute to the railroad cars. Therefore, it appears that the source of the contamination is former spills in the chip chute area.

The concrete core samples collected from the basement and first-floor chip chute walls contained PCBs at concentrations that exceed CALM and PRG criteria; therefore, these areas also pose an environmental concern. Core samples collected from the second floor and from the concrete foundation throughout the basement did not contain PCBs at concentrations that exceed CALM or PRG criteria. The water sample collected from the drain trap located in the south middle area of the Building 3 addition contained 5 µg/L of PCBs, which exceeds the CALM groundwater target concentration of 0.5 µg/L.

Wipe samples collected from the concrete portion of the basement indicate that surficial PCB contamination is present throughout this area. Wipe samples collected from visibly stained areas of the concrete structures contained PCBs at concentrations exceeding CALM and PRG criteria. The PCB contamination source is former leaks from soluble oil piping and from holes in the ceiling of the basement.

Three surface soil samples collected from the basement contained PCBs at concentrations above CALM and PRG criteria. The soil samples collected from the basement did not contain metals or pesticides at concentrations exceeding CALM or PRG criteria. The surface soil samples collected from the quench oil-stained portion of the basement also did not contain PCBs and do not appear pose an environmental concern.

The air samples collected from the eastern portion of the building contained pesticides at concentrations that exceed EPA Region IX PRGs for unrestricted use.

Samples collected at Building 3 were coordinated with EPA Region VII to address the unresolved PCB NON for Building 3. However, based on analytical results, the uncertain future use of SLAAP and Building 3, and the apparent lack of site-specific PCB cleanup criteria that would satisfy regulatory agencies (including MDNR and EPA Region VII) the specific actions required to resolve the PCB NON must be mutually agreed upon so that these actions satisfy the requirements from all interested parties.

Recommendations for areas of environmental concern in Building 3 are summarized below. These recommendations may change depending on the future use of SLAAP and Building 3.

- Soil borings should be completed and sampled in the vicinity of soil boring 3SB-3 to assess the vertical and horizontal extent of PCB and SVOC contamination.
- The paint and the concrete caps on the first and second floors of Building 3 should be repaired.
- The concrete portion of the basement should be decontaminated to remove PCBs.
- Core samples from the basement, first floor of the chip chute, and southern portion of the second floor should be collected to assess the complete extent of contamination.
- Surface soil samples should be collected in the vicinity of 3SS-1, 3SS-1A, 3SS-17, and 3SS-18 to assess the extent of PCB-contaminated soil in the basement.
- The concrete and brick walls of the chip chute in the basement and on the first floor should be remediated to remove PCBs.
- Even though industrial sumps and drains have reportedly been cleaned and flushed, the presence of PCBs in a drain water sample suggests that further characterization of the drainage systems and underlaying soil may be warranted.
- The soil portion of the basement should be evaluated for remedial alternatives to prevent airborne distribution of pesticides.
- Equipment in the basement should be evaluated for removal and disposal.
- In the basement, the separator tank, quench oil pump room and the soil beneath should be assessed for contamination.

13.2.4 Building 4 Conclusions and Recommendations

The areas of environmental concern for Building 4 are depicted in Figure 13-5. The EBS investigation of Building 4 included collection of these wipe samples, one surface soil sample, and one soil boring sample. The wipe samples were collected from the oil stain below the electrical equipment and from the oil stain in the east transformer storage area. These samples contained PCBs at concentration exceeding CALM and PRG criteria. Therefore, these areas pose an environmental concern. The electrical equipment is to be removed. Stained areas below the electrical equipment and on the east transformer pad should be decontaminated to remove PCBs.

The soil sample from the soil boring was collected near the transformer pad and did not contain PCBs at concentrations exceeding CALM or PRG criteria. Therefore, PCB contamination from transformers stored in this area does not pose an environmental concern. However, the soil sample did contain benzo(a)pyrene at a concentration that exceeds the CALM criterion by 0.01 mg/kg and the PRG by 0.108

mg/kg. Therefore, the soil in this area appears to pose an environmental concern. The only sources of benzo(a)pyrene at SLAAP are fuel or quench oils. Building 4 did not contain any process that used fuel or quench oils, and no staining, petroleum odors, or headspace readings above 100 ppm for volatile organic vapors were recorded during boring operations. Therefore, it seems unlikely that petroleum contamination is the source of the benzo(a)pyrene detected.

The surface soil samples collected from the concrete-lined compressor pit contained PCBs at concentrations exceeding CALM and PRG criteria. Therefore, this area poses an environmental concern. The area inside and below the pit may require further characterization and delineation of PCBs contamination. The soil and debris in the compressor pit should be removed and properly disposed of.

13.2.5 Building 5 Conclusions and Recommendations

The areas of environmental concern for Building 5 are depicted in Figure 13-6. At Building 5, wipe samples collected from the elevator penthouse contained PCBs at concentrations exceeding the CALM and PRG criterion of 0.010 mg/100cm². PCB-containing oil is therefore located beneath the elevator equipment and appears to be of environmental concern. The stained areas and elevator equipment should be decontaminated to remove the PCB-contaminated oil.

Soil samples collected from soil borings completed at Building 5 did not contain explosives, perchlorates, metals, VOCs, or PCBs at concentrations that exceed CALM or PRG criteria. However, the benzo(a)pyrene concentration in a soil sample collected from one soil boring did exceed CALM and PRG criteria, and another soil boring sample collected from south of Building 5 contained benzo(a)pyrene at a concentration exceeding the PRG. Therefore, soil in the south side of Building 5 area appears to pose an environmental concern. One possible source of the benzo(a)pyrene is industrial grade oils, which were used at Building 5 when this building supported 30-caliber munitions production. Oil storage in Building 202 J, which was located southwest of Building 5, housed up to four drums of lubricating oils. These may be the source of the benzo(a)pyrene. However, no staining, petroleum odors, or headspace readings above 100 ppm for volatile organic vapors were recorded during boring operations, it seems unlikely that petroleum contamination is the source of the benzo(a)pyrene.

13.2.6 Building 6 Conclusions and Recommendations

The areas of environmental concern for Building 6 are depicted in Figure 13-6. Soil samples collected from soil borings completed south of Building 6 did not contain VOCs, SVOCs, PCBs, metals, perchlorates, explosives, or propellants at concentrations that exceed CALM or PRG criteria. PAHs were detected in shallow soil samples; however, the concentrations of these PAHs were below CALM and PRG criteria and may be representative of background conditions. Another possible source of the PAHs is industrial grade oils, which were used at Building 6 when this building supported 30-caliber munitions production. Oil storage in Building 202 K, which is located south east of Building 6, housed up to four drums of oils.

The hearth ash sample contained metals at concentrations that exceed CALM and PRG criteria. The ash is confined to the hearth and poses an environmental concern. The ash should be characterized, removed, and properly disposed of.

Areas that formerly housed the chemical laboratory, including chemical storage and dark room areas, were also considered potential areas of environmental concern but were eliminated because these areas were not identified during the site inspection because they had been converted into office space.

13.2.7 Building 7 Conclusions and Recommendations

The EBS of Building 7 included the sampling of one soil boring under the cooling tower blowdown discharge area. The soil sample collected from the cooling tower blowdown discharge area did not contain total chromium at a concentration that exceeds CALM or PRG criteria; therefore, it appears that did not have an adverse impact on the environment. Building 7 does not appear to pose an environmental concern, and no further investigation appears to be warranted.

13.2.8 Building 8 and 8A Conclusions and Recommendations

The areas of environmental concern for Buildings 8 and 8A are depicted in Figure 13-2. Buildings 8 and 8A soil samples did not contain PCBs at concentrations that exceed CALM or PRG criteria. However, the soil sample collected from soil boring 8SB-4 exhibited staining and contained SVOCs and VOCs at concentrations that exceed CALM and PRG criteria; therefore, this area poses an environmental concern. The stained soil was limited to the 4- to 5-foot-bgs interval, which is the depth of the former tank farm. Soil borings completed north, east, south, and west of 8SB-4 did not contain SVOCs or VOCs at concentrations exceeding CALM or PRG criteria; therefore, the vertical and horizontal extent of SVOC and VOC contamination in this area is known.

Groundwater samples collected from monitoring well SWMW-7, which is downgradient of 8SB-4, did not contain PCBs, VOCs, or SVOCs at concentrations that exceed CALM or PRG criteria, indicating that the contamination detected in 8SB-4 is not impacting groundwater. Therefore, no further assessment appears to be warranted for the soil and groundwater in this area.

13.2.9 Building 9 and 9A through 9D Conclusions and Recommendations

Soil samples collected from Buildings 9 and 9A through 9D from the sludge pit did not contain VOCs, SVOCs, or PCBs at concentrations that exceed CALM or PRG criteria. The pH of the soil sample collected from soil boring 10SB-5 indicates that the soil in this area is not hazardous; therefore, the former acetylene generation sludge pits do not appear to have adversely impacted the environment. This area does not appear to pose an environmental concern. Therefore, no further action in this area appears to be warranted.

13.2.10 Building 10 Conclusions and Recommendations

Soil samples collected from the soil borings completed around Building 10 and from the sludge tank area did not contain VOCs, SVOCs, metals, or PCBs at concentrations that exceed CALM or PRG criteria. Therefore, the sludge tank area does not appear to pose an environmental concern, and no additional investigation of this area is warranted. The horizontal and vertical extent of soil contamination resulting from the former USTs has been determined. The groundwater sample collected from the monitoring well downgradient of the former UST area did not contain contaminants at concentrations that exceed CALM or PRG criteria. Because the areal extent of soil contamination is known and groundwater contamination is not present, no further investigation appears to be warranted. MDNR has agreed to evaluate the requirements for closing these USTs and issue a no further action letter.

13.2.11 Buildings 11, 11A, and 11B Conclusions and Recommendations

Other than sitewide environmental concerns (such as LBP, ACM, and PCB-containing fluorescent light ballasts), existing Building 11 and former Buildings 11A and 11B, pose no environmental concerns; therefore, no further building-specific actions appear to be warranted.

13.2.12 Recently Identified Areas of Possible Environmental Concern Conclusions and Recommendations

Four 5,000-gallon hydraulic oil tanks used at Building 2 near the two accumulation areas suggests that PCBs may be present at these locations. Additionally, an area in the south-central portion of the second floor of Building 3 may not have been screened for PCBs. This area now consists of empty office space and a hallway. These areas should be further evaluated for PCBs during the site-specific EBS.

At Building 3, the former paint mixing room, outdoor empty barrel storage area, chemicals and oil drum storage areas, wash racks, and paint spray booths may need to be evaluated for possible contamination other than PCBs. PCB sampling would not indicate the presence of other contaminants associated with former SLAAP activities. These areas should be evaluated for contamination other than PCBs during the site-specific EBS.

During the inspection of the laboratory area in Building 6, only the hearth fume hood in the etching area was identified and considered an area of possible environmental concern. The laboratory also had a chemicals storage area and a dark room that were converted to office spaces. These areas should be surveyed for contamination during the site-specific EBS.

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